



Memorandum

To: Distribution

From: Gary Mercer, Kirk Westphal, Beth Rudolph - CDM

Date: April 14, 2003

Subject: Amendment of the Merrimack River Modeling Approach based on Adjustments to the Sampling Program

This memo is issued to notify Merrimack Watershed Study sponsors and participants of a minor change to the planned modeling strategy for the Merrimack River Watershed Assessment Study, as outlined in the Modeling Methodology Technical Memorandum (March 2003).

During January and February of 2003, CDM, the Corps, and the Community Coalition met with representatives of the USEPA, NHDES, and MADEP to review the sampling plan. General consensus was achieved on the overall strategy, but during the development of the sampling plan and the negotiation of the sampling task order, the overall objectives were condensed to include the support of model development and compliance assessment. In order to support both of these objectives, certain elements were added or removed from the sampling program.

The overall scope of the sampling program remains very similar to the original scope, as presented at the meeting of project sponsors and participants in November 2002 (the changes are summarized in CDM's memo dated April 2, 2003). However, several of the changes that affect the sampling program also affect the intended use of the sampling data to support modeling efforts:

- Four dry weather surveys were originally planned, but the current program scope includes only three dry weather surveys, and this has required adjustments to the plan for using the sampling data for model calibration. There will be no anticipated reduction in data used for validation of the models, and the reduction in data for model calibration will be minimal – Two of three (instead of three of four) dry-weather survey results will be used for calibration, but these are “static” events, and the majority of calibration data will come from the dynamic wet-weather survey results, the number of which is not changing.

- The original program included sampling and analysis for selected metals in the receiving water, but this will be included in the final plan only as an option that will be contingent on additional funding or in-kind services from the communities. Hence, modeling of metals will only be undertaken if sufficient data can be collected with assistance from the sponsoring communities.
- Continuous dissolved oxygen data will be collected during a low-flow period for 30 days during the summer of 2003. This data will be collected in two mainstem impoundments, and will provide additional high-resolution dynamic calibration data for the models that would have been unavailable according to the original sampling/modeling plan.
- Bacteria samples will be collected as spatial composites from laterally distributed locations at the transect locations previously identified as requiring three discrete grab samples. The spatially-composited data will better support the calibration of the receiving water model to aggregate mass load in the river. Additionally, single grab samples from the center of the river will be collected at each of these stations.

Table 6-1 of the Modeling Methodology Technical Memorandum outlines the plan for using the sampling data to support model calibration and validation. It is reprinted below with adjustments shown in bold based on the above list. As mentioned previously, the reduction in available data is minimal, considering that the single dry-weather event that has been removed would have provided one set of static data only, and the majority of the calibration data will be obtained from the dynamic wet-weather surveys. There is no reduction in the planned amount of data that will be used for model validation.

Table 6-1 (Revised): Data Sources for Model Calibration and Validation

Adjustments to original plan shown in bold.

Model Element	Modeling Tool	State Variables	Calibration Data Source(s)*	Validation Data Source(s)*
Streamflow at tributaries	SWMM Runoff	Runoff hydrographs at confluences with mainstem	Flow rates from USGS records (where available). Field data from two of three dry weather events and two of three wet weather events.	Flow rates from USGS records (not used for calibration). Field data from remaining dry and wet weather events (one each).
Streamflow in mainstem	SWMM Runoff	Runoff hydrographs along mainstem	Flow rates and river stage from USGS records (Manchester, NH and Lowell, MA). Field data (rating curve readings) from two of three dry weather events and two of three wet weather events.	Flow rates from USGS records (not used for calibration). Field data (rating curve readings) from remaining dry and wet weather events (one each).
Tributary pollutant loads	SWMM RUNOFF	Pollutographs at confluence with mainstem for 11 major tributaries	Field data (pollutant concentrations and flow rates from rating curves) from two of three dry weather events, and two of three wet weather events.	Field data (pollutant concentrations and flow rates from rating curves) from remaining dry and wet weather events (one each).

Model Element	Modeling Tool	State Variables	Calibration Data Source(s)*	Validation Data Source(s)*
Stormdrain pollutant loads	SWMM RUNOFF	Flow hydrographs and pollutographs from stormdrain areas	End-of-pipe stormdrain concentrations from two of three wet weather events. Runoff volume will be calculated by Rational Method.	End-of-pipe stormdrain concentrations from remaining wet-weather event. Rational method for estimate of flow volume.
CSO pollutant loads	SWMM EXTRAN	Flow hydrographs and pollutographs from CSO outfalls	Models already calibrated – calibration records will be reviewed.	End-of-pipe CSO outfall concentrations. There is no good way to validate outfall flow predictions without detailed flow monitoring.
Mainstem river hydraulics	SWMM EXTRAN	River stage and velocity at selected stations	USGS depth records from Manchester, NH and Lowell, MA. Field data from two of three dry weather events and two of three wet weather events (along mainstem). Time-of-Travel studies (two reaches)- also from 1960s report, if CDM studies confirm values.	USGS records from Manchester, NH and Lowell, MA (not used for calibration). Field data from three of four dry weather events and two of three wet weather events (along mainstem). Time-of-Travel studies (same reaches as calibration, different velocities) - also from 1960s report, if CDM studies confirm values.

Model Element	Modeling Tool	State Variables	Calibration Data Source(s)*	Validation Data Source(s)*
Mainstem water quality	WASP	Concentrations of bacteria, nutrients, DO, (metals contingent on funding)	Field data from two of three dry weather events and two of three wet weather events. Continuous DO data (30-days) from impoundments Time-of-Travel studies for dispersion.	Field data from remaining wet and dry weather events (one each).

*Field data from wet -weather events will be time-variable. Field data from dry-weather events will be discrete.